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Institutional Trust Related EDI Lessons for eMarketplaces

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Abstract

Organizations around the world are capitalizing on a proliferation of new technologies and applications over the Internet and World Wide Web to develop e-business. Despite the interest in e-marketplaces, there are still many open questions about e-marketplaces and how they differ from other B2B e-commerce applications. This paper examines the lessons learned from EDI adoption to explain the success or failure of e-marketplace participation. Building upon the notion of institutional trust that develops through situational, structural and procedural factors, we propose a model which identifies facilitating conditions that favor e-marketplace participation. We conclude the paper with implications to theory, practice and directions for future research.

Key words: *EDI adoption, institutional trust, electronic marketplaces, facilitating conditions.*

1. Introduction

E-marketplaces are an important recent phenomenon and are growing rapidly. Forrester Research (www.forrester.com) predicts that transactions through these business-to-business marketplaces will reach \$2.7 trillion by 2004. Varadarajan and Yadav (2002, p. 297) defined e-marketplaces as a “networked information system that serves as an enabling infrastructure for buyers and sellers to exchange information, transaction and perform, other activities related to the transaction before, during and after the transactions.” Segev, Gebauer and Farber (1999) refer to an e-marketplace as “a virtual place where buyers and sellers meet to exchange goods and services”. E-marketplaces enable buyers and sellers to come together and exchange information related to price,

product specifications and terms of trade, and a dynamic price-making mechanism (such as the bid and ask system) which facilitates transactions between firms (Kaplan and Sawhney, 2000) and (Kambil and Van Heck, 2002). According to Bakos (1998), e-marketplaces serve the following three functions: (1) aggregate the supply and demand, (2) facilitate the exchange of goods, services, information and payments associated with market transactions; and (3) provide an institutional infrastructure that enables the efficient functioning of the market.

Previous scholars have identified different types of e-marketplaces. They differ by its focus (Wise and Morrison, 2000); by the type of goods traded (e.g. direct or indirect, single vertical industry or multiple vertical industry, commodity or differentiated), Soh and Markus, 2002; by the type of trading mechanism supported (catalog, auction or exchange, negotiated pricing, or combination), by the type of support activities provided (e.g., inspection, warehousing, transportation, insurance, financing), or by ownership (private trading exchanges, public independent e-marketplaces, or industry consortia). Similarly, Kaplan and Sawhney, (2000) categorized e-marketplaces as seller-oriented buyer-oriented, and neutral e-marketplaces. Varadarajan & Yadav (2002, p.296) suggest the following factors drive the emergence of e-marketplaces.

- Greater information richness of the transactional and relational environment;
- Lower information search costs for buyers;
- Diminished information asymmetry between sellers and buyers;
- Electronic spatial proximity of buyers and sellers;
- Greater temporal separation between time of purchase and time of possession of physical products purchased in the e-marketplace;
- Greater temporal proximity between time of purchase and time of possession of digital products purchased in e-marketplaces.

Despite the recent popularity of e-marketplaces there are many open questions about e-marketplaces as to how they differ from traditional electronic network support for B2B commerce. This study examines the impact of Electronic Data Interchange (EDI) adoption on e-marketplace success. There seems to be a link between industry sectors which have a strong tradition in EDI adoption, such as the automotive industry or the fast moving consumer retail industry, and the apparent success of large e-marketplaces in these sectors such as Covisint (www.covisint.com) for the automotive industry or World Wide Retail Exchange (www.worldwideretailexchange.org) or Transora (www.transora.com) for the fast moving consumer retail industry. The research question of this paper is to what extent does EDI adoption impacts e-marketplace participation. E-marketplace participation refers to the firm's extent of adoption, integration and use of e-marketplace applications and in this study we apply Kaplan and Sawhney's, (2000) categorization of e-marketplaces.

In order to understand the possible impact of EDI adoption on the success of e-marketplaces we use the theory of institutional trust to explain this relation. McKnight and Chervany (2002) describe institutional trust as a critical part of Internet transactions. Institutional trust is trust that is brought about by for example contracts, formal procedures or standards that are issued and guaranteed by institutions. For example, trade laws that are issued by national governments or the EDIFACT electronic message standard that is issued by the EDIFACT working group of the United Nations. More specifically, our research question is: to what extent is the impact of EDI adoption on e-marketplace success mediated by institutional trust?

The rest of the paper is organized as follows. In the next section we discuss the relationship between EDI and e-marketplaces followed by institutional trust leading to the development of the conceptual model and justification of the research propositions. Then we discuss the lessons learned from EDI that contribute to facilitating conditions for e-marketplaces. Finally, we conclude the paper with implications for theory and practice leading to directions for future research.

2. EDI and eMarketplaces

At first glance issues of EDI relationships seem quite different from issues in establishing e-marketplaces. Most e-marketplaces were promoted as price discovery methods, whereas EDI is focused solely on efficient processing of routine trade messages, in particular for electronic purchasing and Just-In-Time (JIT) delivery between companies. So, why would one expect that EDI adoption impacts e-marketplace participation?

In the late 1980's traditional EDI via Value-Added-Networks was a prominent development in electronically connecting companies. Chwelos et al (2001) argue that as B2B e-commerce gains prominence, the use of EDI will remain an important enabling technology. EDI software, products, and consulting services are predicted to grow from US \$800 million in 1997 to \$2 billion annually in 2001 (Densmore, 1998). The main driving factors for EDI include streamlining standardized routine business processes, and back office integration of information systems thus achieving efficiencies from direct savings (i.e. reduced paper flow, administrative costs and transaction costs). Similarly, Premkumar et al (1994) conducted a study of EDI adoption by companies and they identified benefits such as reduced costs, faster turnaround, and better customer services and to a certain extent strategic advantage over their competitors.

EDI, unlike other types of information technology innovations, cannot be adopted and used unilaterally; organizations motivated to adopt EDI must either find similarly motivated trading partners or persuade their existing trading partners to adopt EDI (Hart and Saunders, 1998; Webster, 1995). Both companies in an EDI relationship have to use interoperable hardware and software platforms. Thus, EDI requires integration with other applications for tasks such as; materials planning, payment, accounts payable to create real benefits.

Standards play an important role in EDI adoption and e-marketplaces as they contribute to uniform business practices, trade messages such as purchase orders, purchase order acknowledgement, and invoices (Christiaanse and Markus, 2002). Standardization enforces a routine structure for transaction exchanges that in turn leads to integration and interoperability of the IT systems that facilitates IT connectivity. EDI organizations rely on established standards such as ANSI X12, EDIFACT and forms industry groups that permit regular face-to-face meetings to discuss issues facing EDI operations. Standardization facilitates EDI exchanges (Mukhopadhyay et al., 1995). If messages were not standardized, then the company receiving the message might be unable to process the message that was sent by another company. We investigate the role of standardization in EDI relationships as institutional situation that contributes to technology trust and examine its application on e-marketplaces. We argue that industries with a strong tradition in EDI have an advantage in building e-marketplaces. Standardization is related to trust. Having the right type of standardization in an EDI relationship creates trust for both parties that this relationship will work and create efficiencies. Likewise having the right standards for product descriptions enables effective price comparison, and hence will create sufficient trust that the e-marketplace will fulfil its promise to generate better prices for buyers. Since this trust is not based on personal experience between companies,

but on more formal institutions that coordinate these standardizations, we investigate the impact of EDI experience on building e-marketplaces within the framework of institutional trust.

Price comparisons in e-marketplaces only can work if the sellers have comparable offerings. In other words, the success of an e-marketplace requires transparency of comparable goods, and this requires standardization of product descriptions. For example, aggregated electronic catalogues that describe the offerings of various sellers in a uniform standard way are of vital importance for the success of an e-marketplace. Hence, one of the major projects of an e-marketplace such as Covisint is to develop this aggregated electronic catalogue for car components for the various car manufacturers. The importance of this standardized product information is clear from the strategy applied by many sellers to counteract the buying power of the buyers by frustrating standardization. A typical example of this lack of standardization from the off-line world is the enormous variety of incomparable products in the financial service industry such as insurances or mortgages. This lack of transparency reduces competition (Bakos, 1998). Uniform electronic catalogues provide the structure and standardization for e-marketplace success.

3. Conceptual Model

In this section we discuss the role of institutional trust in EDI and e-marketplaces leading to the development of the conceptual model and research propositions. The institutional view of trust has been studied by various e-commerce researchers (see e.g. McKnight et al., 1998; 2002; Tan and Thoen, 2001; Pavlou, Tan and Gefen, 2002). Institutional trust refers to institutional structures that enable trading parties to transact successfully in an e-marketplace situation. Zaheer et al (1998) suggest that individual members make up an organization and therefore trust relates to organizational trust. In her seminal study, Zucker (1986) suggests that institutional trust is the most important mode by which trust is created in an impersonal economic environment without familiarity and similarity (communality). Zucker describes two dimensions of institutional trust. First, third-party certification to establish a party's trustworthiness. For example, national rules for commercial banks issued by the government to establish trust in the banking sector. Second, escrows guarantee the expected outcome of a transaction. Tan and Thoen (2001) propose the term 'control trust' to describe trust built by control procedures that are issued and enforced by institutions; e.g. the Letter of Credit in international trade. McKnight and Chervany (2002) describe institution-based trust as a critical part of Internet transactions. They introduced two dimensions. First structural assurances, which refer to beliefs that favorable outcomes are likely because of contextual structures, such as contracts, regulations, and guarantees. Second, situational normality, which refers to beliefs that success is anticipated, because the situation is normal. Situational normality in e-commerce refers to e-commerce systems that have security services such as confidentiality, integrity, authentication, non-repudiation, availability and access control mechanism embedded in e-commerce technologies in the form of protocols and best business practices. Best business practices include top management commitment, written policies, procedures, and audit and risk management strategies (see Ratnasingam, Pavlou, and Tan, 2002). Following McKnight and Chervany (2002), institutional trust is defined as the organization's belief that favorable conditions are in place that are beneficial to outcome success. We argue that situational factors describe reasons for forming inter-organizational relationships which is consistent with inter-organizational relationships theory. Pavlou, Tan and Gefen (2002) investigated the role of institutional structures in building trust in different stages (exploration, maturity) of a relationship in B2B e-commerce and introduced a third dimension of institutional trust, called facilitating

conditions, in addition to structural assurances and situational normality. Facilitating conditions are supposed to be less formal than structural assurances, but they are more tangible than situational normality. Facilitating conditions refer to shared standards, and common beliefs about behaviors and goals. In particular, they include a) IT connectivity and interoperability (b) standards and (c) uniform product descriptions. Improved efficiencies in the business operations are derived from the standardization and back office integration of information systems that in turn provide the necessary technological infrastructure for IT connectivity. Standards, ranging from ISO, quality control or message standards, contribute to a routine uniform business practice. Figure 1 presents the conceptual model of institutional trust for e-marketplace participation.

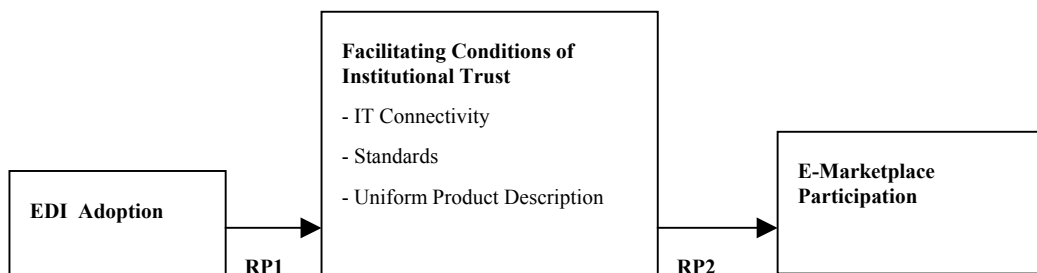


Figure 1: *Conceptual Model of Institutional Trust Facilitating Conditions for E-Marketplace Participation*

The conceptual model (Figure 1) identifies facilitating conditions of institutional trust and its impact on e-marketplace participation. We discuss EDI adoption followed by institutional trust and the dimensions of facilitating conditions which consists of IT connectivity, standards and uniform product descriptions. IT connectivity refers to the extent to which the technological mechanisms enable firms to be IT connected, in order for them to undertake transaction exchanges. By applying the dimensions of EDI adoption from previous research (Chwelos et al., 2001; Iacovou et al., 1995; Premkumar et al., 1994; 1997) we identify three sub-concepts of IT connectivity namely IT compatibility, IS telecommunication infrastructure and internal integration. IT compatibility examines the extent organizations participating in e-commerce are connected by means of hardware, software and third party servers. IS telecommunication infrastructure facilitates the medium of exchange over the Internet and finally internal integration examines the extent organizations have integrated their internal IS systems and applications in order to facilitate their in-house business operations and back end business processes. In the next section we discuss the specific relevance of the role of facilitating conditions in institutional trust for EDI and e-marketplaces, respectively participation respectively.

3.1 EDI Adoption and IT Connectivity

IT connectivity in EDI adoption is traditionally achieved via Value-Added-Networks (VANs) that play the role of a third-party server. VANs include translation software which converts EDI messages from an organization's internal transaction format into the document/message standard for transmission or vice versa. Examples of EDI translator software products include; Telstra Multimedia's Tradelink, GEIS and Premenos' Templar software. Furthermore, the EDI translation software enables this conversion between in-house application software formats and the more generic EDI document formats bi-

directionally, so that both trading partners in the dyadic relationship are able to receive timely, accurate, and reliable information (Emmelhainz, 1990; Marcella and Chan, 1993).

IS telecommunication infrastructure refers to the transmission medium over the Internet that is used to connect the information systems between the organizations (e.g. traditional EDI, Internet based EDI, extranets and secure Internet access). IS telecommunication infrastructure in turn facilitates interoperability of EDI functions that supports inventory control as it uses the state of the art databases, and telecommunications that provide the necessary IS infrastructure to confidently initiate and develop EDI systems.

EDI internal integration creates inter-related databases that are used for controlling, auditing, and reporting security mechanisms, authorization routines, data editing to correct and/or reject and reroute incorrect data, code translation. The databases in turn facilitate translation of the trading partner's part numbers, customer numbers and special codes that are built into applications. Since a significant part of the internal integration is required to establish links with internal applications, we can expect organizations that have integrated their internal applications are more likely to succeed in EDI operations. Therefore, trading partners experience flexibility that supports numerous functionality features including audit/control reports, back-up/restart procedures, software support and costs. EDI clearly is an integral part of JIT delivery schemes and hence requires internal integration of information systems across supply chain (even to the extent of deploying identical software systems). Without internal integration it would be difficult for EDI to facilitate in-house business processes that allow JIT activities to take place in a timely manner thus improving supply chain management activities.

3.2 EDI Adoption and Standards

Standards play an important role in EDI adoption as EDI is used primarily to electronically transfer repetitive business transactions such as purchase orders, invoices, and approval of credits, advance shipping notices, and confirmations. Christiaanse and Markus (2002) suggest that EDI involves standardization of data (business documents like purchase order, purchase order acknowledgement, invoice and advance shipping notice). For example, in the U.S. separate trading partner agreements are usually set up by each EDI transmissions pair reflecting the considerable "interpretative openness" of EDI's document standards. Message standards contribute to a structured manner for transacting messages. EDI standards include American (ANSI X12) standard, and the Guidelines for Trade Data Interchange (GTDI) standard in the United Kingdom. In addition, the Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT) forms the internationally agreed standards, directories and guidelines for the electronic interchange of structured data and, in particular, for the interchange of data relating to goods and services (Holland and Lockett, 1992; Moynihan, 1994; Picard, 1992).

EDICA (1990), the EDI governance body in Australia, formerly called Electronic Commerce Australia (ECA), and now known as Tradegate Australia Pty Ltd monitors the implementation of EDI standards within industry groups. Similarly, industry standards such as the Federation Chamber of Automotive Industry (FCAI) and Federation of Automotive Product Manufacturers (FAPM), consisting of automotive manufacturers and suppliers, were set up to provide instructions in EDI operations guided by standards. FCAI represent members from all automotive organizations who meet bi-monthly to discuss issues relating to EDI usage. On the other hand, open standards in EDI enable automotive suppliers to form a network called the American Automotive Network Exchange (AANX). This network enables buyers to order from any supplier across the globe.

3.3 EDI Adoption and Uniform Product Descriptions

Uniform product descriptions are essential for the success of EDI. If only a trade message such as a purchase order was standardized but not the product that was ordered in the purchase order, then the application-to-application processing between supplier and manufacturer would still not be working. Therefore uniform product codes play an important role in EDI. For example, EAN creates open, global and multi-sectoral standards based on best business practices and drives the implementation of supply and demand chain management. They also contribute to EAN product codes that lead to uniform product descriptions. Similarly, the automotive industry have specific codes for each product followed by item descriptions, that in turn enables trading partners around the world to confidently exchange transactions, as they are familiar with the terminologies. Therefore we propose that:

RP-1 Facilitating conditions of institutional trust are positively associated with EDI adoption

3.4 Facilitating Conditions of Institutional Trust for eMarketplace Participation

Previous scholars suggest that facilitating conditions refer to shared standards, relationship values and common beliefs about behaviors and goals (Heide and John, 1990; Jap and Ganesan, 1999; Morgan and Hunt, 1994). Pavlou et al., (2002) defined facilitating conditions as “the underlying non-governance mechanism that supports transaction success.” They referred to standards that facilitate and support the use of interoperable IT platform. For example, business messages such as EDI standards, and common procedures for uniform product descriptions. Meehan (2001) supports this link between facilitating conditions and standards and suggest that recent industry reports show a growing recognition of the need to establish such standards.

Facilitating conditions engender institution-based trust in e-marketplaces. For example, Covisint provides online support tools for supply chain management integration, electronic document exchange (many based on EDIFACT standards) and an electronic catalogue for car components that aggregate and standardizes the component databases of the various car manufacturers. Pavlou et al. (2002) suggests that facilitating conditions simplify complicated contracts by implementing a single legal generic contract thus replacing the multitude of different contracts that a car manufacture should have to negotiate separately with different suppliers.

Standards play an important role in e-marketplaces as they create uniform product descriptions and a structure in order to facilitate large numbers of buyers and sellers to trade with each other. Price comparison is only possible if all e-marketplaces use uniform product descriptions. Without the uniform product descriptions there is no transparency in e-marketplaces. Similarly, the findings of Dai & Kauffman (2001) also suggest that current B2B e-marketplaces and e-procurement solutions fail to deliver sufficient value in the final step of the e-marketplace cycle. Hence, we assume that standards for e-marketplaces are established according to the needs of a specific community and industry sector (as in the case of Covisint). Therefore, we propose the following research proposition.

RP-2 Facilitating conditions of institutional trust are positively associated with e-marketplace participation.

4. Differences between EDI Adoption and eMarketplace Participation

Although 95% of Fortune 1000 firms have implemented EDI, only 2% of the remaining 6 million businesses in the U.S. have done so (Densmore, 1998). Though the largest firms have aggressively encouraged EDI adoption, they have on average, been able to motivate only 20% of their partners to adopt. Chewelos et al (2001) found that there is a low adoption rate in small business enterprises. The remainder, often comprised of Small Medium-Enterprises have resisted adopting EDI for reasons such as high implementation costs, dominance of power, and other reasons that were not fully understood (Bouchard, 1993; Chewols et al., 2001; Hart and Saunders, 19978; Iaconov et al., 1995; Premkumar et al., 1997; Ratnasingam, 2000). In particular, it was observed in this research that

EDI relationships create lock-in effects for the weakerlock the trading parties by using the weaker partner in a business relation, and that often. In EDI proprietary standards are viewed as a strategic advantage for the dominant partner. However, in e-marketplaces the dominant parties, such as for example the canr manufacturers in Covisint may, want to attract as many sellers as possible, and can hence in this case the dominant partnerbuyer benefits from having open standards that are simple to apply by as many sellers as possible. Hence, contrary to the typical EDI situation iIn e-marketplace open standards can beare thus viewed as a strategic advantage for e-marketplaces.

Past research supports the claim that the impact of competitive pressure (or external pressure, power) was a factor in EDI adoption (See Chwelos et al., 2001; Hart and Saunders, 1998; Iacovou et al., 1995; Premkumar et al., 1997; Ratnasingam, 2000). Although, there has been only limited research done on the role of power in e-marketplaces, which indicates that power also plays a role in e-marketplace participation in the case of Covisint (e.g. Bailey, 2000), we assume that the lessons learned on the role of power for EDI adoption are also partly applicable for e-marketplaces. However, we expect that this power problem is somewhat mitigated in the case of e-marketplaces, because the dominant trading partners tend to endorse open standards that serve their purpose for e-marketplaces so that access is given to many trading partners as possible to do price comparisons.

5. Conclusions

In this section we discuss the implications to theory, practice and suggestions for future research.

5.1 Theoretical & Practical Implications

Lessons learned from EDI together with the importance of institutional structures discussed in this paper provides several new insights for building e-marketplace relationships. Drawing upon the dimensions of institutional trust and the lessons learned from EDI adoption research we suggest that the role of e-marketplace participation must include three facilitating conditions of institutional trust namely, IT connectivity, standards and uniform product descriptions. By analysing the link between EDI adoption and e-marketplaces applying the insights about facilitating conditions and its dimensions, this paper stresses the strategic role of EDI adoption as predictor for e-marketplace participation with institutional trust-building services as intermediate variable. This study contributes to practice as not only does this study provide the rationale for e-marketplaces

to focus on trust-building services for online relationship building and transaction support, but it also prescribes what specific institutional provisions are most needed.

5.2 Suggestions for Future Research

The exploratory study aims to entice future empirical research to validate the proposed theoretical model by empirically showing that EDI adoption facilitates e-marketplace participation. We also plan to undertake research to empirically test the intermediate variable role of facilitating conditions (e.g. established standards, IT innovating and the awareness of external pressure). Christiaanse and Markus (2002) suggest that future studies in e-marketplaces should emphasize on technology, which we have focused on in this study.

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